L. Magnesium Research and Technology Development

Principal Investigator: Eric A. Nyberg
Pacific Northwest National Laboratory
P.O. Box 999, Richland, WA 99352
(509) 372-2510; fax (509) 376-1093;e-mail: Eric.Nyberg@pnl.gov

Technology Area Development Manager: Joseph A. Carpenter
(202) 586-1022; fax (202) 586-6109; e-mail; joseph.carpenter@ee.doe.gov

Expert Technical Monitor: Philip S. Sklad
(865) 574-5069: fax: (865) 576-4963;e-mail: skladps@ornl.gov

Contractor: Pacific Northwest National Laboratory
Contract No.: DE-AC06-76RL01830

Objective

- Support the USAMP's Magnesium Front End Research and Development (MFERD) project in collaboration with China and Canada (See 2.K).
- Compile, document and evaluate state-of-the-art R&D in magnesium (Mg) research around the world as a resource to best determine where U.S. government resources should be directed.

Approach

- Serve as the MFERD U.S. Project Technical Committee (PTC) Chairman, advising the U.S. Project Steering Committee (PSC) member of on-going activities by the PTC and project tasks.
- Assist in the coordination of U.S. MFERD project meetings and joint three-country meetings held in the U.S.
- Evaluate proposals and oversee the effectiveness of the nine tasks of the MFERD project.
- Develop an accessible resource that is available from automotive casting suppliers.

Accomplishments

- Attended the first Canada-China-US Workshop on Automotive Magnesium (Dearborn, MI 10/17-19/05) that established the basis for forming the MFERD project
- Attended the first PSC/PTC working meeting (Kauai, HI, April 2007) where the three-country statement of work (SOW) was developed.
- Participated, by teleconference, in the second PSC/PTC working meeting (Beijing, June 2006) where the SOW was refined, project management and organization guidelines were established, and a timeline was defined.
- Participated in the U.S. MFERD kick-off meeting, introducing the tasks leaders and rolling out work scope to potential U.S. project participants (Detroit, MI November 28, 2006).
- Participated, by teleconference, in the first two PTC meetings (Aug. 24 and Dec. 14, 2006). The purpose of these meetings is to summarize project status for the PSC and to organize future project task meetings.
- Completed the development of the 'Sharepoint' website listing papers written on a variety of Mg research topics from around the world. The site lists titles, authors, contact location and where the information was presented/published. Information is added to the site as it becomes available.

Future Direction

- Primary responsibility for organizing the logistics at the first joint Task Leaders meeting, held in conjunction with the next PSC/PTC meeting (Orlando, FL March 1-2, 2007). Meetings follow the TMS Annual conference.

Introduction

This primary purpose of this project is to support the Canada-China-U.S. collaborative project entitled "Magnesium Front End Research and Development" (MFERD. See 2.K). The goal of the MFERD project is to develop key enabling technologies for a lightweight Mg front-end body structure and other body applications. The MFERD project will develop enabling technologies in high-integrity casting, wrought Mg processing, Mg and dissimilar metal joining and corrosion, and generate scientific understanding in corrosion science, crash-energy management, fatigue, and NVH (noise, vibration and harshness) performance. The project will also provide a platform for Mg research collaboration in Canada, China, and the United States.

Background

The primary goal of the MFERD project is to develop key enabling technologies (body casting, extrusion, sheet & joining) and knowledge base (crashworthiness, NVH, durability, and corrosion) for primary (load-path) body applications of Mg alloys. The following are some specific objectives:

- Define materials and develop manufacturing processes for Mg body castings, extrusions, sheet, and joining technologies.
- Develop knowledge base and define Mg body technical requirements in crashworthiness, NVH, durability, corrosion, and surface finishing.
- Enhance the infrastructure for integrated computational materials engineering for Mg applications, including alloy design/ development, process optimization, and component manufacturing.
- A total life-cycle analysis showing the net benefit of vehicle lightweighting, using Mg vs. energy consumption, emission, and pollution in Mg production.
- High-quality professionals and students educated in materials science, engineering, and Mg research and development (R&D) infrastructure in Canada, China, and the United States.
- Establish automotive OEM / supplier / academia collaboration in Mg body applications.

PNNL Approach to Supporting MFERD Project and Database Development

As the U.S. Project Technical Committee Chairman, I have participated in all project-related meetings since the initial three-country meeting held in Dearborn, MI in October 2005. The continuity and background developed because of this participation has made me uniquely qualified to advise the U.S. Project Steering Committee representative (Dr. Joseph A. Carpenter, Jr.) on the technical issues, task status, and cultural complexities that can, and will develop, as the project matures.

Currently, we are in the midst of organizing the details for the U.S.-hosted Task Leaders' meeting that will be held in Orlando, Florida on March 2nd, 2007. This meeting will follow the joint PSC/PTC meeting on March 1st and is the first opportunity for the task leaders from each country to meet together. We are organizing all aspects of the facility/meeting arrangements.

We have also completed the Mg R&D database of international research. This is a searchable Sharepoint website that is ready for public deployment upon approval of the DOE Technology Area Development Manager.

Conclusions

This technical-support project is aimed at effectively assisting in the management of the U.S. portion of the three-country MFERD project. To date, we have completed the SOW, Terms of Reference, and assigned the management, advisory and technical task leader positions for the MFERD project.

Additionally, this project will serve as a resource for future funding decisions related to DOE-funded Mg projects.

Future Work

Future work will be to evaluate progress of the tasks, participate in committee meetings, report results and make recommendations to the PSC.

Upon approval, the SharePoint Mg R&D Database will be publicly available in FY 2007.

In addition, recommendations on critical areas of R&D funding, that are not being addressed, will be made to the DOE Technology Area Development Manager.

Presentations

"*Magnesium Automotive R&D in North America,*" J. Jackman, J. Carpenter, E. Nyberg, at the Intl. Conference on Mg Alloys and their Applications, Dresden, Germany, November 6, 2006.